

HUFNAGEL, A. 1918. *Recherches histologiques sur la métamorphose d'un lépidoptère (Hyponomeuta padella L.)*. Arch. Zool. exp. gén. 57: 47—202.

JORDAN, H. E. 1920. *Studies on striped muscle structure. VI. The comparative histology of the leg and wing muscles of the wasp*. Amer. J. of Anat. 27: 1—67.

— 1920. *Studies on striped muscle structure. VII. The development of the sarcostyle of the wing muscle of the wasp*. Anat. Rec. 19: 97—123.

KOSHIHARA, H. and K. MARUYAMA. 1958. *Changes in fine structure of honey-bee thoracic muscle during pupal development*. Scient. Papers Gen. Education. 8: 213—216.

LAMPARTER, H. E. 1966. *Die strukturelle Organisation des Prothorakalganglions bei der Waldameise (Formica lugubris Zett.)*. Ztschr. f. Zellforschg. 74: 198—231.

LOTMAR, R. 1945. *Die Metamorphose des Bienendarmes (Apis mellifica)*. Beihefte zur Schweiz. Bienenzzeitung. 1: 443—506.

MARKL, H. 1966. *Peripheres Nervensystem und Muskulatur im Thorax der Arbeiterin von Apis mellifica L., Formica polyctena Foerster und Vespa vulgaris L. und der Grundplan der Innervierung des Insekthorax*. Zool. Jb. Anat. 83: 107—184.

MORISON, G. D. 1928. *The muscles of the adult honey-bee (Apis mellifera L.)*. Quart. J. Micr. Sci. 71: 563—651.

OERTEL, E. 1930. *Metamorphosis in the honey-bee*. J. Morph. 50: 295—332.

PÉREZ, Ch. 1910. *Métamorphose des muscides (Calliphora erythrocephala Mg.)*. Arch. Zool. exp. gén. 4, Sér. 5: 1—266.

PIPA, R. L. 1963. *Studies on the Hexapod nervous system. VI. Ventral nerve cord shortening, a metamorphic process in Galleria mellonella (L.) (Lepidoptera, Pyralidae)*. Biol. Bull. 124: 293—302.

— and P. S. WOOLEVER. 1964. *Insect neurometamorphosis. I. Histological changes during ventral nerve cord shortening in Galleria mellonella (L.) (Lepidoptera)*. Ztschr. f. Zellforschg. 63: 405—417.

RISLER, H. 1954. *Die somatische Polyploidie in der Entwicklung der Honigbiene (Apis mellifica L.) und die Wiederherstellung der Polyploidie bei den Drohnen*. Ztschr. f. Zellforschg. 41: 1—78.

SCHARRER, B. 1939. *The differentiation between neuroglial and connective tissue sheath in the cockroach (Periplaneta americana)*. J. Comp. Neurol. 70: 77—88.

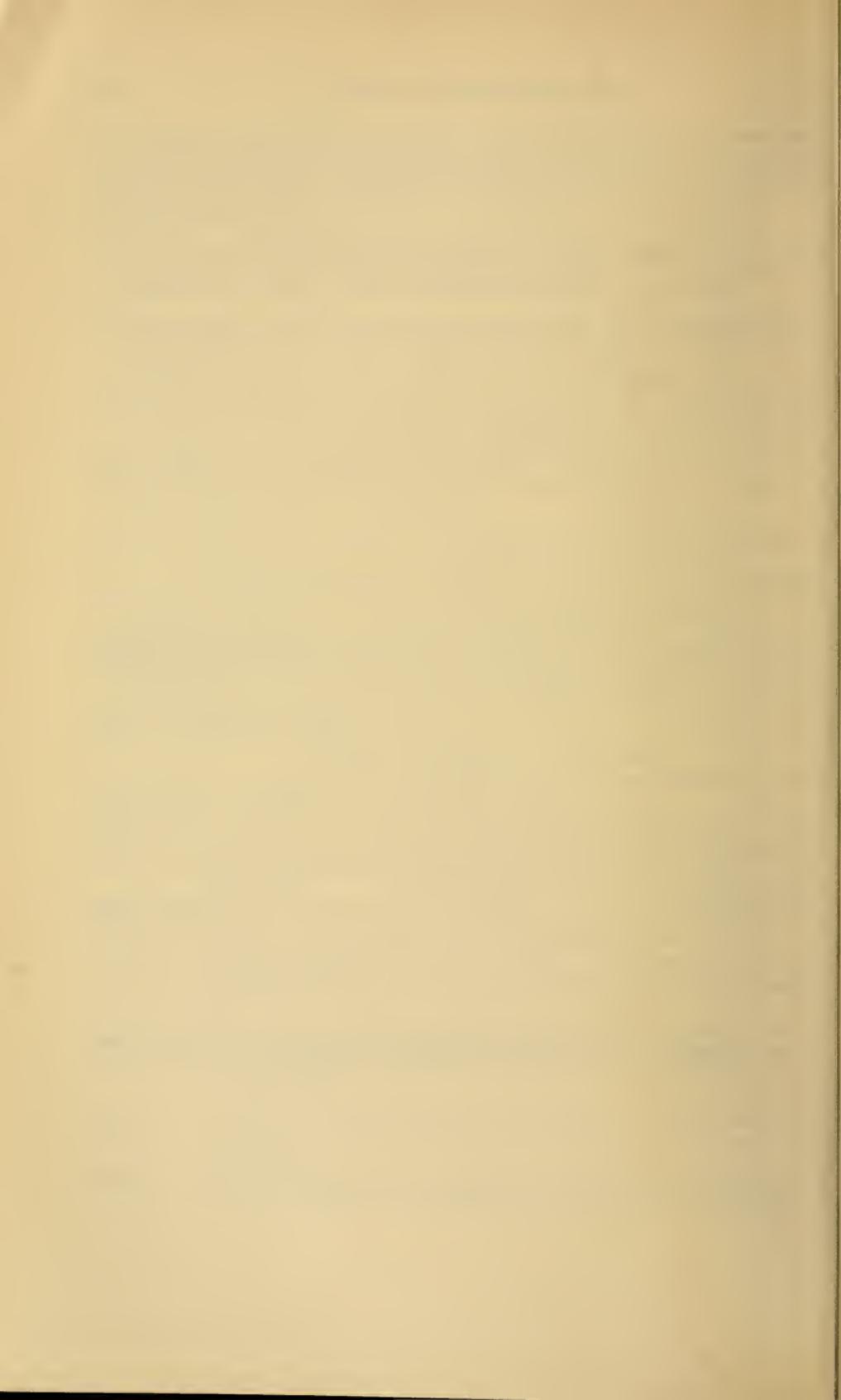
SNODGRASS, R. E. 1956. *Anatomy of the honey-bee*.

STOEPOE, J. et G.-Th. DORNESCO. 1936. *Etudes sur le système nerveux des insectes pendant la métamorphose. La gaine périganglionnaire*. Arch. Zool. exp. gén. 78: 99—115.

TIEGS, O. W. 1955. *The flight muscles of insects*. Philosoph. Trans. Roy. Soc. 238: 221—345.

WIGGLESWORTH, V. B. 1955. *Physiologie der Insekten*.

— 1959. *The histology of the nervous system of an insect Rhodnius prolixus (Hemiptera)*. Quart. J. Micr. Sci. 100, III. Ser.: 299—313.



Indian Pyrgomorphini other than *Pyrgomorpha* (Orthoptera: Acridoidea: Pyrgomorphidae)

by

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With 69 figures

The tribe *Pyrgomorphini*, as understood by KEVAN and AKBAR (1964), includes numerous genera, most of them African, although a few are distributed in Madagascar and Eurasia¹. The genera found in India are: *Pyrgomorpha* Audinet-Serville, 1838, *Zarytes* Bolívar, 1904, and *Anarchita* Bolívar, 1904. None of these extends to Ceylon although all occur in peninsular India. *Pyrgomorpha* is a large, widely distributed Old World genus in need of thorough revision (this is being currently undertaken), so that it would be premature to treat it here, even although only two species seem to occur in India proper. One of these species (Figs. 59-64) is *P. bispinosa* Walker, 1870 (=*P. indica* Bolívar, 1902), which is closely related to *P. cognata* Krauss, 1877, from the Eremian region, and to *P. conica* (Olivier, 1791), whose centre of distribution is the Mediterranean, but whose eastern and southern limits have not yet been certainly determined. The other Indian species (Figs. 65-68) is *P. inaequalipennis* Bolívar, 1904, a small, stoutish, seemingly valid species, so far known only from higher elevations in northwestern India (the holotype, in Geneva, is from Kulu, now Sultanpur, although this is not mentioned in the original description)². A third species, *brachycera* Kirby, 1914, previously assigned to *Pyrgomorpha*, is here transferred to *Zarytes*. The latter genus, like *Anarchita*, has hitherto been recorded only from southern India.

¹ The subtribal arrangement of KEVAN and AKBAR (*l.c.*) has recently been slightly modified, but the genera included in the tribe remain the same (KEVAN, AKBAR and CHANG, *in press*).

² What may be the same species is now known to me from E. Afghanistan.

Zarytes I. BOLÍVAR

Pyrgomorpha; Bolívar, 1884, *An. Soc. esp. Hist. nat.* **13**: 23, 422, 495 (partim); 1902, *Ann. Soc. ent. Fr.* **70**: 606 (partim); Kirby, 1914, *Faun. Brit. Ind., Acrid.*: 160, 174 (partim).

Zarytes Bolívar, 1904, *Bol. Soc. esp. Hist. nat.* **4**: 456; 1909, *Gen. Ins.* **90**: 27, 32; Kirby, 1910, *Syn. Cat. Orth.* **3**: 326; 1914, *Faun. Brit. Ind., Acrid.*: 160, 177; Bolívar, 1918, *Rev. Acad. Cienc. Madr.* **16**: 388; Ramachandra Rao, 1937, *J. Morph.* **61**: 223, 226, 227, 230, 232-236, 238-240, 242, 246, 252, 254; Neave, 1940, *Nomencl. zool.* **4**: 693; Schulze, Küenthal *et al.*, 1954, *Nomencl. Anim. Gen. Subgen.* **5** (26): 3694; Dirsh, 1956, *Trans. R. ent. Soc. Lond.* **108**: 356; Kevan, 1962, *Publ. cult. Cia. Diam. Ang.* **60**: 115; 1964, *Can. Ent.* **96**: 1497; Kevan and Akbar, 1964, *ibid.*: 1526.

Type species (by monotypy): *Pyrgomorpha squalina* Bolívar, 1884 = *Zarytes squalinus* (Bolívar)¹.

Zarytes differs from *Pyrgomorpha* in having the head somewhat less abruptly convex dorsally in lateral view, the frons less strongly concave, a more compressed pronotum with well developed, straight, dorsal carinae, less distinct oblique carinae on the lateral pronotal lobes, the lobes themselves being more rectangular with straighter inferior margins and the inferoposterior angles forming more or less regular right-angles (not rounded, obliquely truncated or with prominent points); the tegmina are lanceolate or strongly abbreviated, or (most typically) both; the epiphallus is more transverse than in *Pyrgomorpha*, having a broader bridge and less acutely produced lateral projections of the lateral plates; the ectophallus has a narrower central membrane; the valves of the endophallus lack the ventral subapical pockets (accommodating the aspices of the aedeagal sclerites) found in many species of *Pyrgomorpha* and in *Anarchita* (Fig. 31). The genitalic characteristics of all three genera are indicated by KEVAN, AKBAR and CHANG (*in press*).

The genus was erected by BOLÍVAR (1904) to accomodate a single Indian species previously placed by him in *Pyrgomorpha*. UVAROV (1929) indicated that he believed there to be two species in southern India. He did not, however, name the second species nor give any indication of how it was supposed to differ from the type species because, not having the holotype available, he was uncertain which of the populations that he had before him was the one to which the name *squalinus* applied. One of his populations, which he tentatively referred to the type species, was from the upper Palni Hills (Madras State), and the other was from lower elevations at Pollachi (also in Madras State and not far distant from the Palnis).

A re-examination of UVAROV's material (kindly made available by Dr. Bernd Hauser of the Natural History Museum, Geneva), and a comparison

¹ *Zarytes* is masculine in gender—see BOLÍVAR (1909)—not feminine as it is usually regarded.

with the holotype of *Z. squalinus* (borrowed through the courtesy of Dr. A. Kaltenbach of the Natural History Museum, Vienna), shows that UVAROV was correct in regarding his "Upper Palni" specimens as agreeing more closely with typical *Z. squalinus* than the Pollachi material. The latter specimens are a very little more robust and have the frons slightly less oblique than in the typical form. There are also minor differences in the shape and length of the tegmina (slightly shorter and less acute), but these can be disregarded, for such variations are without taxonomic significance in *Pyrgomorphidae*. However, in series that I have examined, collected at between 6000 and 7500 feet in the Kodaikanal area of the upper Palni Hills, specimens comparable with the Pollachi material were also found, together with more typical examples. Specimens from other localities in the upper Palnis showed a mixture of forms with intermediate conditions of robustness, tegminal length and acuteness of frontal angle, although the tendency was towards the more robust condition and a slightly less oblique frontal profile. The longest series, recently collected on a single day (12.IV.1969) at Pillar Rocks, Kodaikanal (7000 feet), and kindly presented to me by Dr. R. E. Blackith, showed less tendency to vary away from the more typical condition.

A comparison of the phallic structures, more particularly the epiphalli and endophalli (Figs. 2-12, 14-24, 26, 27), of a wide range of specimens showed that there is considerable variation in the exact form of these structures, but that this is not correlated either with locality or the slight variations in external morphology. It is clear that all available material of *Zarytes* from southern India belongs to a single species and that no recognizable subspeciation has occurred. For the most part, the specimens all have greatly abbreviated tegmina and hind wings which vary somewhat in their exact form but which are nearly always micropterous (very much shorter than the hind femora); only one specimen, of about 150 examined, has tegmina approaching the hind femora in length.

In addition to material from southern India, a very few (8) specimens of *Zarytes* are also known from central and northern India. The most conspicuous feature of these is that more than half of them have long tegmina. Three are fully macropterous, with tegmina extending beyond the hind "knees"; one has tegmina only slightly shorter; and a fourth has tegmina comparable in length with that of the longest-winged specimen known from southern India. In addition, these specimens are all rather slender and have frontal profiles as oblique or more so than in any southern material, but these differences are not absolute. The epiphallus and endophallus (Figs. 1, 13, 25) also seem to differ slightly, but, in view of the considerable variation in southern populations, and of the fact that only a single northern male is available, it would be unwise to conclude, and in any event it would seem very unlikely, that two distinct species are involved. When material from the more northerly parts of southern India (Deccan) become available, it is to be anticipated that the two groups will be found to form a continuum.

As the macropterous form of the northern population already has a name, *brachycerus* (Kirby, 1914), it would, for the present, seem prudent, in view of the differences mentioned, to regard the northern and southern forms as subspecies of *Z. squalinus*.

Zarytes squalinus I. BOLÍVAR

Pyrgomorpha squalina [Saussure, *in litt.*] Bolívar, 1884, *An. Soc. esp. Hist. nat.* 13: 423 (refers only to the typical subspecies).

The two subspecies here recognized may be tentatively distinguished as follows:

Macropterous or other rather long-winged forms apparently frequent; frontal profile more oblique and thorax in dorsal view tending to be a little less divergent distad (Figs. 35-42); epiphallus with bridge broader (Fig. 1); endophallus a little longer with apodemes less expanded in lateral view (Figs. 13, 25); C., N.E. and N. India *Z.s. brachycerus* (Kirby). Usually micropterous, macropterous forms unknown, tegmina only rarely approaching hind femora in length; frontal profile slightly to distinctly less oblique and thorax in dorsal view tending to be a little more divergent distad (Figs. 43-54); epiphallus very variable but bridge usually at least a little narrower (Figs. 2-12); endophallus also variable but usually a little shorter with apodemes distinctly expanded in lateral view (Figs. 14-24, 26, 27); S. India *Z.s. squalinus* (Bolívar).

The known distribution of these two subspecies is shown in Figure 69.

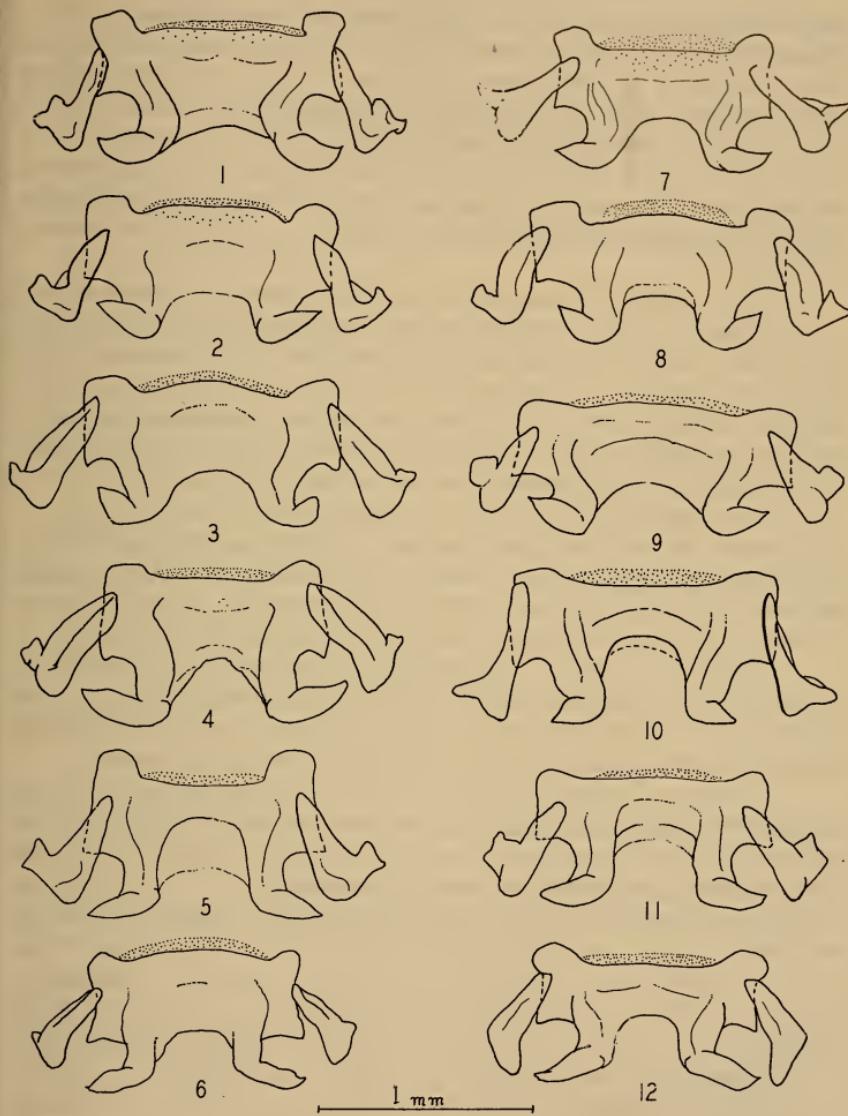
Zarytes squalinus brachycerus (KIRBY), stat. et comb. nov.

(Figs. 1, 13, 25, 35-42)

Pyrgomorpha brachycera Kirby, 1914, *Faun. Brit. Ind., Acrid.*: 175, 176 (Fig. 114 [♀]).

KIRBY (1914) described and illustrated this species from a single female from "Bengal", and, since that time, it has not been referred to in literature. ["*Pyrgomorpha brachycera*" of Latif, Haq and Ahmad (1959) undoubtedly does not refer to the present species, but probably to the widely distributed Indian and Pakistani species, *P. hispanica*. The same may be true of the records under this name from the Nagarjuna (Andhra Pradesh) localities given by Tandon and Shishodia (1969), but I have not seen their material].

The holotype is in the British Museum (Natural History), London, and photographs of it will be published elsewhere (KEVAN, AKBAR and CHANG, *in press*). It bears the following labels: (1) old grey disc with "N. Bengal" on the obverse and "42/45" on the reverse side; (2) *P. cren.* [referring erroneously to



FIGS. 1-12.

Zarytes squalinus (Bolívar), epiphalli, dorsal. 1, *Z.s. brachycerus* (Kirby), Amarkantak, Rewa, Madhya Pradesh; 2-12, *Z.s.squalinus* (all from Madras State unless otherwise indicated): 2, Pillar Rocks, Kodaikanal, Palni Hills; 3, Pumbarai, Palni Hills; 4, Kukal, Palni Hills; 5, Kodaikanal, Palni Hills; 6, 8 miles S.E. of Hassan, Mysore State; 7, Coimbatore; 8, as 2; 9, Madukarai, Coimbatore District; 10, as 4; 11, Pollachi; 12, as 2.

Attractomorpha crenulata, which it vaguely resembles], one of Walker's series so labelled [in W. F. Kirby's handwriting]; (3) brachycera, Bengale, Kirb. [also in Kirby's hand]; (4) specimen figured in Fauna of India; (5) British Museum orange-bordered "Type" disc. The specimen measures 25 mm in length, as shown in the original illustration (not 21 mm as given in the original description). The hind legs are now lacking, but the bright rosy red of the hind wings is still retained. The specimen is macropterous, with the tegmina and hind wings clearly surpassing the end of the abdomen and (from Kirby's figure) the "knees" of the extended hind legs.

In addition to the holotype, closely similar specimens are known as follows: 1♂ "Amarkantak, Rewa State, C.P., Sta. 5: 1.II.1927, Nerbudda Survey, H. S. Pruthi", and 1♀ "Jumnagwar, Gharwal dist., base of W. Himalayas, [U.P.], 16.III.1910" (Figs. 35-38). The male is very similar to the female, but smaller and more slender and with slightly longer, simple cerci not reaching the apex of the acutely triangular epiproct; subgenital plate acute in dorsal and lateral views.

Three other forms differing in the relative lengths of the tegmina are also known. These may be given "technical designations" as follows:

f. *mesopterus* : tegmina at rest falling only a little short of end of the abdomen, longer than the hind femora and extending approximately to, but not surpassing, the hind knees (Fig. 39): the representative specimen (♀ "type") is labelled "Chotagnagpur, Netarbat, Ranchi Dist., [Bihar] 27.I.1954, A. P. Kapur".

f. *brachypterus* : tegmina of approximately equal length to the hind femora, reaching to about their middles when the latter are extended (Figs. 40, 41): the representative specimen (♀ "type") is labelled "Dindori, Mandla dist., Central Provinces [Madhya Pradesh], 7.VI.1927, Narbudda Survey, B. Chopra".

f. *micropterus* : tegmina much shorter than the hind femora, not nearly reaching their middles (Fig. 42): the representative specimen (♀ "type") is labelled as for the "type" of f. *mesopterus*. There are also two other females with the same data; this form is very similar to typical *Z.s. squalinus*.

The measurements (in mm) of the various specimens referred to above are as follows:

Form	Body length	Pronotum	Tegmen	Hind femur
Typical				
♀ holotype	25	4.8	17.3	(ca. 11)
♀ Jumnagwar, U. P.	21.5	4.8	17.2	10.2
♂ Amarkantak, M. P.	20.5	3.4	14.0	—
f. <i>mesopterus</i>				
♀ "type"	27.5	5.2	15.0	12.5
f. <i>brachypterus</i>				
♀ "type"	24	4.6	9.9	10.2
f. <i>micropterus</i>				
♀ "type"	25	4.9	7.0	10.5
♀ Netarbat, Bihar	27.5	5.2	7.0	11.5
♀ Netarbat, Bihar	26	4.8	9.0	—

Representative, or "type", specimens of the various forms of this and the next subspecies are currently in the author's collection, Lyman Entomological Museum.

Zarytes squalinus squalinus (I. BOLÍVAR)

(Figs. 2-12, 14-24, 26-29, 43-54)

Pyrgomorpha squalina Bolívar, 1884, *An. Soc. esp. Hist. nat.* **13**: 422, 423, 495
(first and last pp. do not combine generic and specific names); 1904, *Bol. Soc. esp. Hist. nat.* **4**: 456.

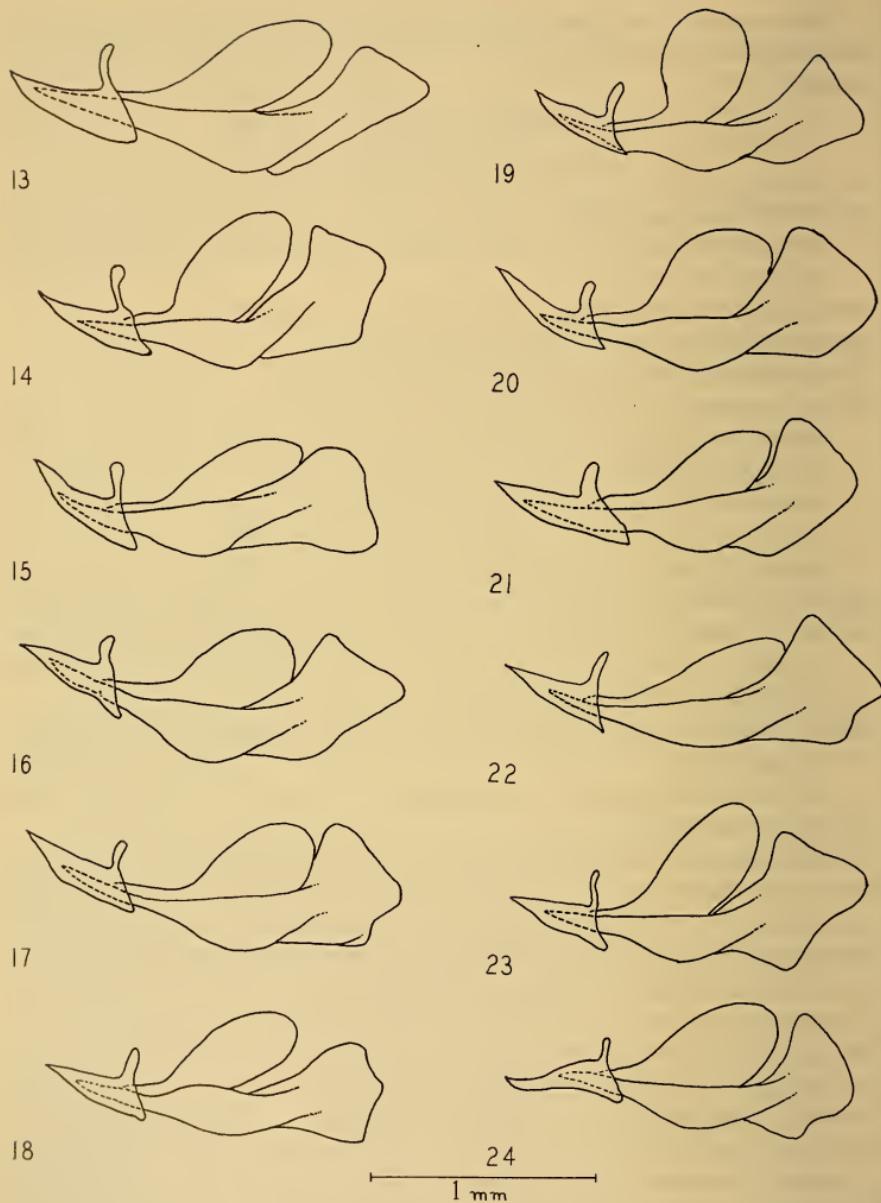
P[ygromorpha] squalina; Bolívar, 1902, *Ann. Soc. ent. Fr.* **70**: 606.
Z[arytes] squalinus; Bolívar, 1909, *Gen. Ins.* **90**: 32.
Z[arytes] squalina; Kirby, 1910, *Syn. Cat. Orth.* **3**: 326.
Zarytes squalina; Kirby, 1914, *Faun. Brit. Ind., Acrid.*: 177; Bolívar, 1918, *Rev. Acad. Cienc. Madr.* **16**: 391; Ramachandra Rao, 1937, *J. Morph.* **61**: 225 [Cytology]; Makino, 1950, *Rev. Chromos. Numb. Anim.* [in Japanese], Tokyo: 56 [Cytology]; 1951, *Atlas Chromos. Numb. Anim.*, Iowa: 86 [Cytology]; 1956, *Rev. Chromos. Numb. Anim.* (Rev. Ed.), Tokyo: 56 [Cytology]; Mason, 1969, *Eos, Madr.*, 44 (1968): 291 [Tympanum mentioned].

Z[arytes] squalina and *Zarytes* sp.n.; Uvarov, 1929, *Rev. suisse Zool.* **36**: 547.
Zarytes [squalinus]; Ramachandra Rao, 1937, *J. Morph.* **61**: 223, 226, 227, 230, 232 (Fig. 5)-236, 238-240, 242, 246, 247 (Fig. 15, 16), 252, 253 (Fig. 45, 46, 49, 50), 254, 255 (Fig. 64) [Cytology].

Zarytes squalinus; Dirsh, 1956, *Trans. R. ent. Soc. Lond.* **108**: 273, pl. 21 (Fig. 3) [Epiphallus].

Note: the combination *Zarytes squalinus* was not used by BOLÍVAR (1904) when he erected *Zarytes*.

This subspecies, as previously noted, is typically micropterous, the tegmina being much shorter than the abdomen and not reaching nearly half-way along the hind femora. The holotype is rather small and has tegmina of slightly greater than average length, reaching nearly half-way along the abdomen. It is in Vienna and is labelled as follows: (1) *P[ygromorpha] squalina* S. Ind. orient. Coll. Br. v. W. [= Brunner von Wattenwyl]; (2) 18/12.749; (3) Mus. Caes. Vindobon; (4) Holotype [on purple]. The "S" on label (1) presumably refers to Henry de Saussure—to whom Bolívar (1884) attributes the specific name—and not to "Sud" (South). However, although Bolívar (*I.c.*) gives only "India" as the type locality, the specimen is certainly from southern India. It undoubtedly came originally from a series in Saussure's collection, now in Geneva, labelled "Indes or. Sss". [by hand] (1♂, 1♀—there is also a similar ♀ in Philadelphia), "Indes or. Mr. Hy. d. Sauss." [by hand] (2♀♀), or "Indes or. int. Mr. Hy. de Sauss." [printed] (4♂♂, 4♀♀—there is also a similar ♂ in Philadelphia), for these are all labelled in Saussure's hand "Pyrgomorpha squalina Sauss." [on yellow]. Saussure's "Indes



FIGS. 13-24.

Zarytes squalinus (Bolívar), endophali from right.
 13, *Z.s. brachycerus* (Kirby), locality as in Fig. 1;
 14-24, *Z.s. squalinus*, localities as in Figs. 2-12 respectively.

or." specimens of other species nearly all come from what is now Madras State. These specimens, like the holotypes, were apparently first preserved in alcohol and subsequently pinned and dried. As a consequence they have shrunk somewhat and are of rather small size, the holotype having contracted from 25 mm in length (as given in the original description) to 23.5 mm. Like most of the other specimens referred to above, the holotype has also become somewhat unnaturally compressed, so that, in dorsal view, it appears even more slender than is usual for the subspecies (and thus very like micropterous examples of subsp. *brachycerus*). Photographs of the holotype will be published elsewhere (KEVAN, AKBAR and CHANG, *in press*).

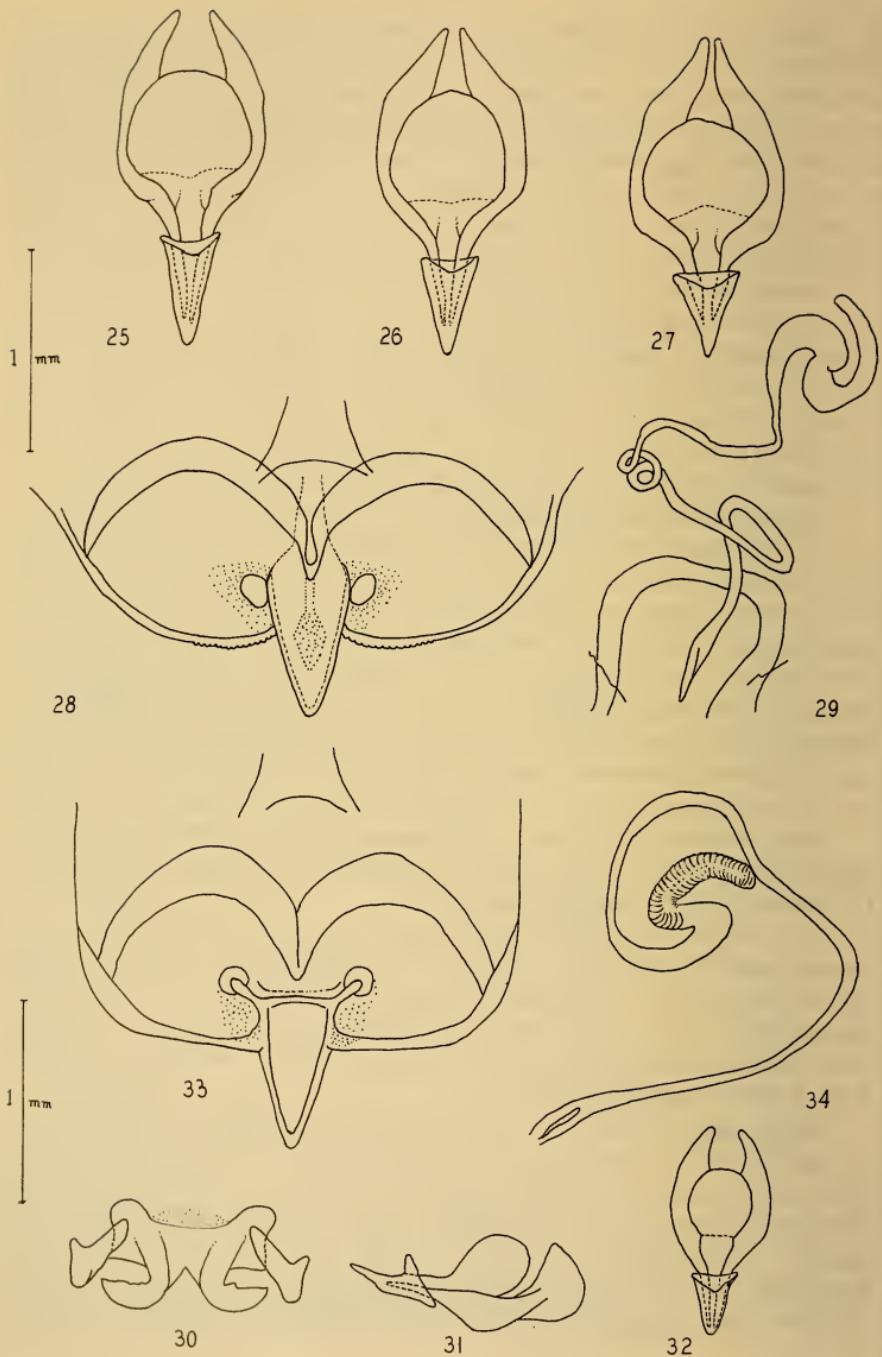
All known specimens of this subspecies are micropterous except for one female labelled "Madukarai, Coimbatore Dist., [Madras State.] S. India, 19.iv.37". This has tegmina approximately equal in length to the hind femora (Figs. 49, 50), and may be given the "technical designation" of f. *brachypterus* analogous to the similar form in subsp. *brachycerus*. The measurements of this representative specimen (♀ "type") are given in the accompanying table.

The only specific localities published for *Z. s. squalinus* are: Madurai (Maduré or Madura), Madras State (Bolívar, 1902; followed by KIRBY, 1914, and BOLÍVAR, 1918), Goorghally Estate, S. Mysore State (BOLÍVAR, 1918); Pollachi, S.W. Madras State (UVAROV, 1929—as *Zarytes* sp.n.) and the upper Palni Hills (Pumbarai; near Kukkal [= Kukal] and Mariyanshola), S. Madras State (UVAROV, *l.c.*). Ramachandra Rao (1937), who discusses the chromosomes of *Z. squalinus*, does not specify where he obtained his material, but, as he was working at Bangalore, Mysore, one may presume his specimens were from that general area. The following (in addition to Saussure's specimens already mentioned) have been examined (author's collection, Lyman Entomological Museum, unless otherwise indicated):

State Unknown. Ind. Orient., 1♀ (Hannover); India, 1♀ (Willemse Collection, Maastricht); Ind. or., P[ère] Castets [probably from Madurai, Madras State], 1♂ (Brussels), 3♀♀ (1 Brussels, 2 Madrid).

Mysore State (S.): Baba Budan Range [= Bababuddin Hills, Chikmagalur District,] 4500 ft, 1.III.1969, R. E. & R. M. Blackith, 4♀♀; 10 mi. N. Belur, 1025 m, 20.II.1962, E. S. Ross & D. Cavagnero, 1♀ (San Francisco); Goorghally Estate, 3300 ft, 14-24 Mar. [19]18, P. S. [Nathan] Coll., 2♀♀ (1 in London [determined and referred to by Bolívar (1918)]); 8 mi. S.E. of Hassan, 1.III.1969, R. E. & R. M. Blackith, 4♂♂.

Madras State: Alagar Kovil, Madura[i] Dt., S. India, 17.III.[19]36, 1♂ (further ♂♂ and ♀♀ in London); the same, 20.III.36, 1♀; Coimbatore, S. India, 15.III.[19]37, 3♀♀ (1 in London); the same, 21.IV.37, 1♂; Kodaikanal [Palni Hills], Pres. Madras, India, 19.IV.1921, C. Leigh, 3♀♀ (Philadelphia); Kodaikanal, Pulney [= Palni] Hills, India, 1922, C. Leigh, 1♀ (Philadelphia); Kodaikanal, Palni Hills, ca. 6500-7500 ft, 13.V-12.VI.[19]25, Gravely, 2♀♀, 2♂♂; the same, 1.V-15.VI.1926, 1♂, 1♀; Kodaikanal, S. India, 7000 ft, 21.III.[19]36, 4♂♂, 8♀♀



(2♂♂, 4♀♀ in London); the same, 24.III.36, 1♂, 1♀ (*in cop.*—London); the same, 27.III.36, 4♀♀ (2 in London); Kodaikanal, Madras State, "Pillar Rocks", 7000 ft, 12.IV.1969, R. E. & R. M. Blackith, 18♂♂, 24♀♀ (2 pairs *in cop.*); Grasland bei Kukal (Palnis), 1-4.IV.[1927], Voy. Carl et Escher, Inde méridionale, 1♂; as last without "(Palnis)", 3♂♂, 1♀; as last with 1800-2000 m added, 2♀♀ [this material is all in Geneva and referred to by Uvarov (1929)]; Ind. or., Madras, P[ère] Castets, B[runner] v[on] W[attenwyl] 17.857, 1♂, 1♀ (Vienna) ["Madras" probably does not refer to the city, but more likely to somewhere in the Madurai district of the state]; Madukarai Coimbatore Dist., S. India, 19.IV.[19]37, 2♂♂ (1 in London), 1♀ (f. *brachypterus*—see above); Maduré [= Madurai], P[ère] Castets, 1♀ (Madrid) [basis of record by BOLÍVAR (1902)]; Upper Palnis, Mariyanshola, 2400 m, 11-14.IV.[1927], Voy. Carl et Escher, Inde méridionale, 2♀♀ (Geneva) [referred to by UVAROV (1929)]; Methupalaym, 17.X.[19]21, A. A. coll., 1♂; the same, P. S. Nathan coll., 1♀ (London); Palni [as Pulney] Hills, South India, 8-6000 ft [sic], 10-31 May, [19]17, 2♂♂ (London); the same, 4-7000 ft, 10-22 May, 1917, T. V. S. coll., 2♀♀ (London); Upper Palnis, 2000-3000 m, 5.IV.[1927], Voy. Carl et Escher, Inde méridionale, 2♂♂ (Geneva); Pollachi, 21.II.[1927], Voy. Carl et Escher, Inde méridionale, 1♂, 1♀ (Geneva) [referred to by UVAROV (1929)]; Pumbarai, Upper Palnis, Grasland F. R., 1800 m [no date], Voy. Carl et Escher, Inde méridionale, 1♀ (Geneva); as last but lacking "Upper Palnis" and "F. R.", 27.III.[1927], 1♂ (Geneva) [referred to with last by Uvarov (1929)]; Sethumadai, 20 km S.W. of Pollachi, 1♂ (London); Shembaganur nr. Kodaikanal [Palni Hills], S. India, 6000 ft, 28.III.[19]36, 1♀; Shembaganur, S. India, A. Hayne, 1♂ (Helsinki).

Kerala State: Walayar [E. Malabar District], S. India, P. S. Nathan, 1♀ (London).

There is considerable colour variation throughout this material, although the majority of the specimens are of a generally brown phase (all those from Pillar Rocks are rather dark); some specimens are uniformly greenish, and a few (mostly females) are distinctly green with partially dark reddish dorsa.

The measurements (in mm) of 23 representatives of the subspecies are as follows:

Figs. 25-34.

Zarytes squalinus (Bolívar) and *Anarchita aptera* (Bolívar), genitalic apparatus. 25, *Z.s. brachycerus* (Kirby), endophallus, dorsal, locality as in Fig. 1; 26, 27, *Z.s. squalinus*, endophallus, dorsal, localities as in Figs. 9 and 5 respectively; 28, the same, ♀ subgenital plate, dorsal, locality as last; 29, the same specimen, spermatheca and duct; 30-32 *A. aptera*, epiphallus, dorsal, and endophallus from right and dorsal respectively, Dohnavur, Tinevelly District, Madras State; 33, the same, ♀ subgenital plate, dorsal, same locality; 34, the same specimen, spermatheca and duct.

Locality	Body length	Pronotum	Tegmen	Hind femur
♀				
(S.) India, holotype	23.5	4.6	7.5	10.7
Madukarai, "type" of				
<i>f. brachypterus</i>	27.5	5.7	10.5	11.5
Alagar Kovil	29	5.3	5.8	11.0
Coimbatore	29	5.2	5.2	11.0
"	30	6.8	7.7	12.8
Kodaikanal, 7000 ft	24.5	5.0	5.9	11.0
"	26	5.2	8.0	11.3
"	22	4.2	4.8	10.0
"	27	5.3	6.5	12.3
"	26.5	5.2	5.0	12.0
"	29	5.5	6.0	12.5
" 6500-7500 ft	25.5	5.3	5.8	12.0
"	24	4.8	6.5	11.2
"	25	4.2	5.6	11.3
Shambaganur	27.5	5.4	6.1	12.3
♂				
Kodaikanal, 6500-7500 ft	18.5	3.5	4.2	9.0
"	17.5	3.4	4.7	9.0
"	17.5	3.5	4.2	9.0
" 7000 ft	19	4.0	5.2	9.1
"	18	3.5	4.2	9.0
"	18.5	3.6	4.2	9.0
"	19.5	4.1	5.3	9.2
"	20.5	3.6	5.3	9.0

Anarchita I. BOLÍVAR

Pyrgomorpha; Bolívar, 1902, *Ann. Soc. ent. Fr.* **70**: 606 (partim).

Anarchita Bolívar, 1904, *Bol. Soc. esp. Hist. nat.* **4**: 459; 1909, *Gens. Ins.* **90**: 27, 33; Kirby, 1910, *Syn. Cat. Orth.* **3**: 327; Waterhouse & Sharp, 1912, *Index zool.* **2**: 15; Kirby, 1914, *Faun. Brit. Ind., Acrid.*: 160, 178; Bolívar, 1918, *Rev. Acad. Cienc. Madr.* **16**: 388; Schulze, Kükenthal *et al.*, 1926, *Nomencl. Anim. Gen. Subgen.* **1**(2): 164; Neave, 1939, *Nomencl. zool.* **1**: 178; Kevan, 1962, *Publ. cult. Cia. Diam. Ang.* **60**: 115; 1963, *Nova Guinea* (n.s.) **10**: 362; Kevan & Akbar, 1964, *Can. Ent.* **96**: 1526; Kevan, 1968, *Proc. R. ent. Soc. Lond.*(B) **37**: 162.

Type species (by monotypy): *Pyrgomorpha aptera* Bolívar, 1902 = *Anarchita aptera* (Bolívar).

Anarchita is readily recognizable from all other Asiatic members of the tribe Pyrgomorphini, with the exception of the monotypic genus *Arbuscula* Bolívar, 1905, in being quite apterous. *Arbuscula cambodjiana* Bolívar, 1905, however, is not closely related to *Anarchita*, being easily distinguishable by its much more strongly striated integument and short antennae with fused apical segments. The copulatory structures (KEVAN, 1968) also differ from those of *Anarchita* (Figs. 30-34), which are rather similar to those of *Pyrgomorpha*. *Arbuscula* is

known only from Cambodia and Laos, although it may be noted here that a male specimen recently discovered in the collection of the Lyman Entomological Museum (only the third example of *Arbuscula* known) bears an old handwritten label, "India (?)", which is surely erroneous. The specimen is considerably larger than the only other known male (KEVAN, 1968), but it seems to belong to the same species.

Anarchita aptera I. BOLÍVAR

(Figs. 30-34, 55-58)

P[yrgomorpha] aptera Bolívar, 1902, *Ann. Soc. ent. Fr.* 70: 607; 1904, *Bol. Soc. esp. Hist. nat.* 4: 456; International Council, 1904, *Int. Cat. sci. Lit. (Zool.)* 1: 784.

Pyrgomorpha aptera; Bolívar, 1904, *Bol. Soc. esp. Hist. nat.* 4: 459.

A[narchita] aptera; Bolívar, 1904, *ibid.*: 459; 1909, *Gens. Ins.* 90: 34.

A[narchita] Aptera; Kirby, 1910, *Syn. Cat. Orth.* 3: 327.

Anarchita aptera; Kirby, 1914, *Faun. Brit. Ind., Acrid.*: 178; Mason, 1969, *Eos, Madr.*, 44 (1968): 292 [Tympanum mentioned].

This is not a well-known species, but I have examined several short series from southern India. No holotype was designated at the time of the original description, but syntypes exist in Madrid and Paris. As lectotype, I designate the only known male syntype. This is in Madrid and has the measurements given by BOLÍVAR (1902) for the male. It bears BOLÍVAR's determination label "P. aptera" and the data "Ind. or. P. Castets". Neither this nor any other syntypic specimen carries an indication of the type locality, "Maduré" (Madurai), given in the original description, but many of Père Castets' specimens were from this place, although they rarely indicate it, so that the lack of the place name on the data label is not especially significant. There are also, in Madrid, three female syntypes (paralectotypes) with similar data labels to that of the lectotype. They all differ slightly in measurements from those given in the original description. In Paris, however, is one female, presumed also to be a syntype (paralectotype), which agrees in measurements with BOLÍVAR's description. This is labelled "Pyrgomorpha aptera Cotype Bol." and "Museum Paris, Indes Or. Pantel 1911". The latter is presumably not original and was doubtless put on the specimen by Pantel at some time subsequent to its description and on transference from his own collection to the general series in the Paris Museum. The former collection contains two further females and one juvenile with the same data as the lectotype, the juvenile incorrectly bearing a purple "type" label. Photographs of the lectotype and the Paris "Cotype" (paralectotype) will be published elsewhere (KEVAN, AKBAR and CHANG, *in press*).

No record of the occurrence of this species has been published other than from the type locality (BOLÍVAR, 1902; KIRBY, 1914). Material other than that

discussed above is known to me as follows (in author's collection, Lyman Entomological Museum, unless otherwise indicated):

Madras State (S.) : Cape Comorin, S. India, III.[19]36, (London) [number of specimens not recorded]; Dohnavur, Tinnevelly [= Tirunelveli] Dt., S. India, 350 ft, 5.III.[19]36, 1♀; the same, 5.X.38, 1♂ [other material from same locality in London]; Kayattar, 7.IV.1969, R. E. & R. M. Blackith, 1♀; 22 mi. N.W. of Palayamkottai, 7.III.1969, R. E. & R. M. Blackith, 7♂♂, 12♀♀, 1 juv.

The specimens vary from greenish-grey to reddish-brown in general coloration, most being greyish-brown. Males vary from 16 to 19 mm in body length; females from 22.5 to 27.5 mm. The known distribution of the species is shown in Fig. 69.



FIG. 69.

Known distribution of *Zarytes squalinus* (Bolívar) and *Anachitta aptera* (Bolívar).
 Solid circles (●), *Z. s. squalinus*; open circles (○), *Z. s. brachycerus* (Kirby);
 Open squares (□), *A. aptera*.